AD-A082 208 CLEMSON UNIV S C DEPT OF CIVIL ENGINEERING F/G 8/13
FIELD AND LABORATORY STUDY OF STORM SWASH AND OVERWASH DYNAMICS--ETC(U)
FEB 80 J S FISHER DAAG29-78-G-0170

UNCLASSIFIED ARO-13258.1-GS NL

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4-80
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered) ARO 13258.1-GS & 16260.1-GS

ADA082208

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REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER
2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
(6) Field and Laboratory Study of Storm Swash and Overwash Dynamics

5. TYPE OF REPORT & PERIOD COVERED
(9) Final Report

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
(16) John S. Fisher

8. CONTRACT OR GRANT NUMBER(s)
(15) DAAG29-78-G-0170

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Department of Civil Engineering
Clemson University, Clemson, S.C. 29631

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
U. S. Army Research Office
Post Office Box 12211
Research Triangle Park, NC 27709

12. REPORT DATE
Feb 28, 1980

13. NUMBER OF PAGES
4

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)
(12) 6

15. SECURITY CLASS. (of this report)
Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
NA

16. DISTRIBUTION STATEMENT (of this Report)
(18) ARO, ARO
Approved for public release; distribution unlimited.

DTIC
1980

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)
NA (19) 13258.1-GS, 16260.1-GS/A

18. SUPPLEMENTARY NOTES
The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

swash	beach erosion
washover	dune erosion
overwash	beaches
beach profiles	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
Field studies at Assateague Island quantified the flux and frequency of overwash. Repeated surveys at several washovers revealed that storm generated overwash transports sand landward up to 100 m past the beach crest for storms characterized by 1 year return periods. Post-storm winds transport this material seaward, past the frontal dune line. Thus, overwash of this magnitude does not supply permanent sediment to the island interior or bay. Very large storms could transport sediment to the bay, but this is the exception at the study site. Laboratory and field studies show that backshore structures, e.g., dunes

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

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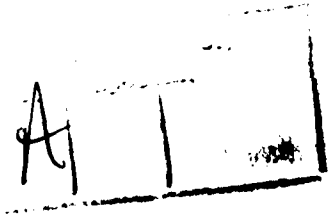
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

407467

20. Abstract continued:

or seawalls,inhance the backwash, and thus beach erosion. In the case of dunes however, the dune erosion feeds the storm beach and thus offsets the erosion potential. A separate laboratory study demonstrated that heavy mineral washover laminations can be related to the depth and velocity of individual overwash surges.



1. Problem Statement

The role of overwash in the overall sediment budget on barrier islands is widely disputed. The project analysed the question at several levels, including

a. gross and net washover sediment budgets,

b. overwash hydraulics,

c. and washover mineralogy.

Both field and laboratory studies were undertaken.

The North Beach of Assateague Island National Seashore was selected as an excellent example of a barrier island experiencing frequent overwash activity. A single overwash fan complex was selected approximately two miles north of the Assateague State Park boundary. This site has man-made barrier dunes which are presently eroding during major storms. The sediment budget was determined by surveying a single washover monthly, as well as after large storms. During the storms, overwash depths and velocities were recorded in an attempt to quantify the flow hydraulics.

The laboratory component was introduced in order to make detailed measurements of storm swash and overwash surges, as well as the resulting sedimentation patterns. Particular emphasis was directed at the difference between overwash and wave uprush which is blocked by dunes and other barriers. A separate study examined the grading of heavy minerals within isolated washover laminations.

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2. Summary of Results

Prior to this study no systematic attempts had been made to quantify the role of washovers in barrier island sediment budgets. We restricted our study to a few washovers on Assateague Island, and our conclusions may not be transferable to barriers in general. During the course of the three year study there were many large winter storms, as well as one moderate hurricane. We did not experience any storms comparable to the famous March 1962 northeaster, and thus our conclusions must be viewed in the context of the events studied.

The study area is presently experiencing widespread erosion, both of its beach and dunes. This erosion is most probably due in large part to the presence of Ocean City Inlet. During periods of storm waves and surge, sand is deposited landward of the beach crest in washovers, wherever the dunes are breeched. The source of sand for these washovers appears to include the nearshore, beach and dunes. For a typical moderate storm, the washover deposit will extend about 100 m landward of the frontal dune line. A gradual and persistent destruction of the frontal dunes was recorded during the study period. Thus, the washover entrance or throat gradually increased, often resulting in adjacent washovers becoming a single unit.

The sand which was deposited in the washovers during the individual storms did not remain in place. The general model of washovers suggests that these storm deposits will eventually be transported to the bay side of the barrier. At Assateague, we found that the post-storm wind would consistently blow this material back to the beach. In fact, we occasionally found the post-storm aeolian deflation exceeded the overwash deposit.

In fact, it appears that the average storm washover helps to maintain the island against the persistent wind erosion.

If an exceptionally large storm is able to transport sand by overwash entirely across the island, then the post-storm wind will be unable to re-work it seaward. This was observed on one occasion at a site just north of our study area.

The conclusion from our study with regard to overwash sediment budgets is that these deposits are often merely temporary reservoirs for seaward aeolian transport. Although we were unable to document the ultimate fate of the wind blown sand, it was probably lost to the littoral zone.

The laboratory studies centered on two questions, the interaction of storm swash and backshore barriers, and the mechanisms for the deposition of washover laminations. Considering the former, we found:

1. the presence of a backshore barrier results in an increase in backwash intensity,
2. this increase results in an amplification of erosion,
3. dunes act as both barriers and sand reservoirs, thus mitigating their adverse impact.

The laboratory study of laminations showed that washover deposits can be interpreted in terms of duration of overwashing and, in a relative sense, surge heights and velocities by analysis of the laminations in the deposit. The experiments indicated that surges of different heights and velocities produce different bands within the deposits. Small surges leave the preexisting bed undisturbed and deposit a layer of light minerals. Large surges erode the preexisting bed and deposit a lamination that grades from heavy minerals to light minerals. Various compinations of large and small surges produce identifiable sequences. For example, a series

of small surges would produce a thick light mineral band, while a series of large surges would produce a thick heavy mineral band. Mixed large and small surges produce a deposit of mixed light and heavy mineral laminations.

3. List of Publications

Fisher, J.S., and D. Stauble, "Impact of Hurricane Belle on Assateague Island Washover", Geology, Vol. 5, December, 1977.

Fisher, J.S. and D.K. Stauble, "Washover Interaction on a Barrier Island," Proc. Coastal Zone 1978, ASCE, 1978.

Stauble, D.K. and J.S. Fisher, "Swash Mechanics and Backshore Structures" submitted, Journal of Waterway Port Coastal and Ocean Div., ASCE.

Murray, W.G. and J.S. Fisher, "Interpretation of Washover Laminations", submitted, Journal of Sedimentary Petrology.

Murray, W.G., Hubbard, D.A., and J.S. Fisher, "Mineralogical Composition and Variation of a Washover Fan", in preparation for Journal of Sedimentary Petrology.

Fisher, J.S., "Barrier Island Washovers: Sediment Budgets", in preparation for Journal of Geology.

4. List of Supported Personnel

1. J.S. Fisher, Principal Investigator

2. D.K. Stauble, Ph.D. earned May 1979
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